# Work Plan

## Phase II Community Groundwater Monitoring, Analysis and Planning in Sierra Nevada Granitic Fractured Rock within the Non-Basin Region of Eastern Fresno County

The work plan's scope includes implementing upgrading to a state-of-the-art condition two school sites in which to monitor and track groundwater usage with seasonal and long term trends analyzed within the Big Sandy Watershed of the upper San Joaquin River Basin, (USGS HUC 18040006). The school sites service the unincorporated communities of Prather, Auberry and Tollhouse. The intent is to use the two school sites to better understand the underlying geology and hydrological processes – and the subsequent recharge capabilities with a goal of long-term sustainability of these key wells over time. Information collected on a real-time basis will also be integrated with DWR's CASGEM (California State Groundwater Elevation Monitoring) and WDL (Water Data Library) databases. Furthermore, it is expected that the approach, protocols, methodologies and state-of-the-art technologies utilized can be a framework for conducting further studies with the Southern Sierra Integrated Regional Water Management (IRWM) Planning Group and their communities that rely upon groundwater as a major resource. Included with the monitoring and analysis is a groundwater management planning and community education component. The long-term goal is to have the community understand through information provided and consensus building as to the current and future groundwater supply with verifiable and real-time data. With public awareness, then Fresno County can move forward on developing groundwater management policies within non-basin areas with long-term sustainability – with the added benefit of a greater likelihood of public acceptance and support.

To achieve these outcomes under the work plan, the following tasks are proposed:

1) Upgrade Well Management Systems (2 School Sites: System Control & Data Acquisition - SCADA) with Remote Access based upon Fresno County WAC's Technical Memorandum
    a. With Flowmeters and transducers already in place utilizing a prior grant from the NRCS – install SCADA and Historian Systems at Foothill Elementary School and Sierra Middle/High School per iCAD dsign/cost proposal as attached
    b. QA/QC (quality assurance/quality control) SCADA installation with Factory Acceptance Testing (FAT) process
    c. IT (Information Technology) infrastructure integration verification
    d. System Operation start-up, debug and training
    e. Remote access capabilities
    f. Data collection verification
    g. Develop agreement and protocols for continuous system operations and support with Sierra Unified School District's IT Department and Sierra Resource Conservation District
    h. On-going data collection and analysis

2) Integrate Well Management SCADA System with DWR's CASGEM/WDL Program
    a. Determine SCADA data file structure and compare to CASGEM/WDL data structure for compatibility
    b. Develop mapping of SCADA data content to allow for maximum automated transfer capabilities into CASGEM/WDL databases
    c. Test and validate automated transfer process (QA/QC)
    d. Determine frequency measurements required for CASGEM/WDL and develop automated schedule of data transfer

3) Integrate Well Management SCADA System with Fresno County/California Water Institute (CWI) Database System
    a. Compare SCADA data file structure with Fresno County/CWI data structure for compatibility
    b. Develop mapping of SCADA data content to allow for maximum automated transfer capabilities into Fresno County/CWI
    c. Test and validate automated transfer process (QA/QC)
    d. Determine frequency measurements required for Fresno County/CWI and develop automated schedule of data transfer
    e. Obtain Approval of Groundwater Data Management System with Fresno County Water Advisory Committee based upon implementation of Technical Memorandum

4) Establish Educational Research Program at Sierra High/Middle School and Expand Program at Lyles College of Engineering, CSU Fresno
    a. Develop educational program for high school students with science department as project opportunity or extracurricular
    b. Expand existing education/research program with Lyles College Department of Civil Engineering for undergraduate and graduate students

5) Determine initial groundwater quantity conditions and develop trend analysis capabilities
    a. Analyze static well level and flowmeter usage data
    b. Compare seasonal and annual precipitation data
    c. Analyze percolation and Evapotranspiration information
    d. Determine net recharge values and develop correlations to usage data
    e. Compare data and correlate with DWR's PSA and DAU Analysts under CWP-2009

6) Establish Community Outreach and Education Program (4 meetings & 4 articles) and update website
    a. Develop Outreach and Education Plan
    b. Update and maintain Watershed Portal Web Site for Project activities, deliverables, reports, publications, educational materials, and for water use data acquired
    c. Submit 1st of 4 articles on project to local newspaper
    d. Send out notifications to stakeholders via the internet
    e. Notice, Plan and Conduct Community/Public Informational "Kick-off" meeting
    f. Notice and Conduct two quarterly Community/Public "Progress Update" meetings
    g. Submit 2nd and 3rd articles on current status of project to local newspaper
    h. Notice and Conduct "Final Findings and Outcomes" Community/Public meeting
    i. Submit 4th article on project's "Final Findings and Outcomes" to local newspaper

7) Project Office Operations and Administration (2.5%)
    a. Set up Office for on-going day to day operations and administration
    b. Assure PO Box, Email and other communications are established

8) Four (4) Quarterly Reports, Final Project Report and Invoicing
    a. Complete and submit quarterly reports per DWR's requirements
    b. Submit monthly invoices per DWR's requirements
    c. Complete and Final Project Report per DWR's requirements
    d. Perform Project close-out

# Project Work Plan Exhibits

A. Fresno County Water Advisory Committee Technical Memorandum and site maps for continued groundwater study dated February 16, 2012

B. iCAD, Inc. Sierra Unified School District Well SCADA (System Control and Data Acquisition) and Historian Design Engineering and Implementation Proposal to Sierra Resource Conservation District dated July 5, 2012

C. Map of Upper San Joaquin River Basin and Big Sandy Watershed with Project Locations Identified

Exhibit A

Fresno County Water Advisory Committee Technical Memorandum and site maps for continued groundwater study dated February 16, 2012

Fresno County Water Advisory Committee

Sub-committee Technical Memorandum

TO: Harry Armstrong, FCWAC Chair, FCWAC Advisory Committee Members, Alan Weaver, County Public Works Director and Sierra Resource Conservation District Directors and Advisors

FROM: Mountain and Foothill Geohydrology Advisory Sub-committee; Richard Frank, Sarge Green, Chris Johnson and Ron Taylor

DATE: 2-16-2012

SUBJECT: Implementation of Monitoring Activities at the Sierra Unified School District Campus Complexes to Assist Community Water Users in Understanding Mountain and Foothill Water Conditions Variability

The Fresno County Water Advisory Committee (WAC) has been reviewing the technical and policy issues associated with mountain and foothill water availability and conditions for some time. As a result, several advisory changes to the County technical requirements for water supply minimums have been forwarded to the County Planning Department and the Board of Supervisors. Some of the recommendations have been adopted by the County to assure that when someone proposes to develop a water supply for the mountain and foothill geographic area, the potential applicant has some assurance the ongoing water needs of their domicile or enterprise have a likelihood of being met. The simple fact is that in the geographic area of discussion, the availability of water is largely dependent on the extent and depth of fissures or cracks in the bedrock base of that landscape. There are very few locations where sufficient soil or other water-holding materials are available for what would be considered a true groundwater basin. The actual analysis of the technical and policy needs of the area have been conducted by the Sub-committee named above who volunteered their experience to advise the entire Committee.

During the WAC deliberations of the above activities, some other representatives of the mountain and foothill communities have attended and availed themselves of the Committee's information. Specifically, the Sierra Resource Conservation District (SRCD), a special district that covers most of the area of discussion, became interested in addressing some of the information needs that assist in defining the water conditions in the area. SRCD sought and obtained a grant from the California Department of Water Resources to gather pertinent information in a pilot project area within the SRCD. The pilot project involved preliminarily defining the sources, uses and threats to the water supplies in an area of concern that had some existing information already. Near the conclusion of the study, the SRCD representatives brought the gathered information to the Sub-committee and full WAC for discussion and advice on how to complete some elements of the project and to ask for recommendations on how to implement those elements. Specifically, the WAC has recognized and advised Fresno County that one

of the chief ongoing needs of assessing the capacity and long-term viability of the water resources in the area is the need for representative hard-rock water monitoring networks that can fairly evaluate the conditions in various areas of the entire geographic domain. Such an effort has thus far been beyond the scope of any existing agency or entity in the area but nonetheless a critical element of any rational analysis of the water conditions and their sustainability given the likelihood of future land use changes resulting from inevitable population growth of the existing residents or highly likely in-migration.

One of the technical findings of the SRCD study has been that at least two water supply/use locations are being monitored in a relatively sophisticated manner. The regional education campuses that include Sierra High School and Foothill Elementary have hard-rock wells that have some level of depth and flow monitoring. Upon bringing that information to the WAC, the WAC sub-committee offered to provide advice on how to elevate that effort to one that could provide the larger community with some very good information on the annual and longer fluctuations in conditions in the geologic location at the campus that in the view of the WAC technical Sub-committee is likely representative of a larger area.

The Sub-committee technical recommendation is as follows. The equipment at the wells used by the campus complex should be investigated thoroughly for potential upgrading to measure depth to water on a continuous basis and have that information wi-fi'd or hard-wired to a computer and web-site that can be broadcast or otherwise made available to the local public at large. The system then can act as a "sentinel" for other similar areas. Similarly, water use information from the flow meters at the site should be collected so as to show the likely demands made by the representative uses, inside and outside the campus facilities, over a water year. The larger goal would be to show over various year types (it appears that the current year may be a very dry year making it an ideal situation for beginning the reporting of changes in water depth and use), what is happening in the representative bedrock storage cracks. The Sub-committee further recommends the effort to conduct this monitoring be recognized by the full WAC with a commendation to the School District for any of their efforts to serve the larger community by developing and sharing any of the information needed to understand water conditions in the area. The California Water Institute and related Geographic Information Center at Fresno State have offered to permanently store both the local campuses and SRCD regional data gathered so as to preserve the long-term record.

It is probable that the advanced monitoring effort described above has some costs associated with it that may be beyond the current financial ability of the School District, therefore the Sub-committee also recommends that a voluntary contribution effort be organized in the area to obtain sufficient funds to allow for the installation and operation. Finally, the Sub-committee would offer itself to the degree appropriate in assisting both the fund drive and with education or training of the School District staff and/or potential student operators on the monitoring system and communicating the information to the public. The ongoing effort could also potentially involve the engineering school at Fresno State who also participated in some of the work on the SRCD project.

Attachments: Locations of the campus monitoring systems


Sierra Middle/High School (SM/HS)
Well Site
Control Building
Panel / Flowmeters
Waste Water
Treatment Facility
Well Site
Storage Tank
Google earth

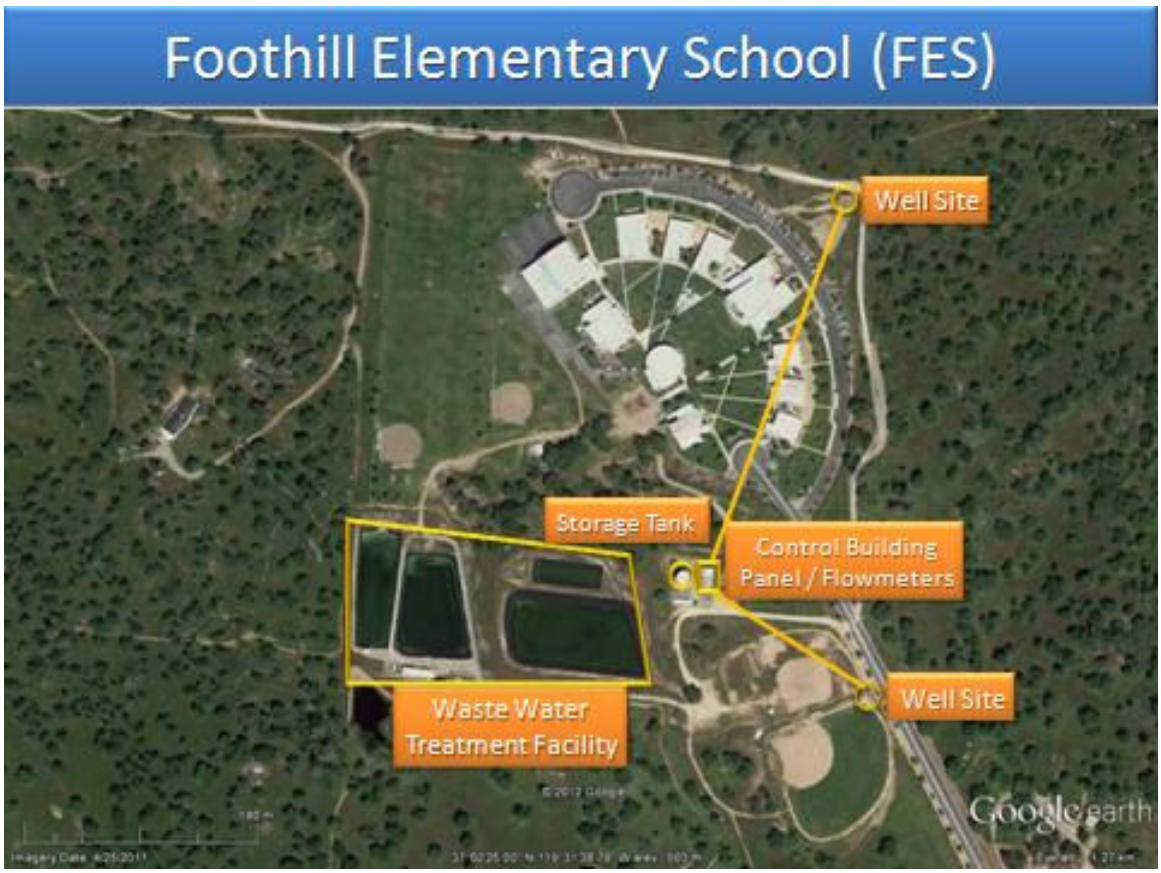
Foothill Elementary School (FES)
Well Site
Storage Tank
Control Building
Panel / Flowmeters
Well Site
Waste Water
Treatment Facility
Google earth

Exhibit - B

ICAD INC.
INDUSTRIAL CONTROL AND DESIGN

3585 E. Date Avenue
Fresno, CA 93725
Office (559) 498-0290
Fax (559) 498-0292
www.icadautomation.com

# Sierra Resource Conservation District

## Sierra Unified School District
## Well SCADA and Historian

QUOTE #2460A
July 5th, 2012

*Control Systems That Mean Business*

iCAD INC.
INDUSTRIAL CONTROL AND DESIGN

3585 E. Date Avenue
Fresno, CA 93725
Office (559) 498-0290
FAX (559) 498-0292
www.icadautomation.com

July 5, 2012
Quote #2460A

Mr. Steve Haze
Project Manager
Upper San Joaquin River Watershed Program
Sierra Resource Conservation District
PO Box 693
Auberry, CA 93602

Mr. Haze,

At this time Industrial Control And Design, Inc. is pleased to submit for your review and approval its budgetary proposal to provide the required additions and modifications to the Sierra Unified School District well sites at Sierra High School Farm Pump House and the Foothill Middle School Pump House to create a Supervisory Control and Data Acquisition (SCADA) network between the two facilities.

## 1. Referenced Information

1.1. This budgetary proposal is based on the following referenced information and assumptions:

1.1.1. On-site meeting on 6/18/12 attended by Mr. Haze and Mr. Taylor.

1.1.2. ICAD job #1425 for the Tank Level Control System at Sierra High School (7/10/03).

1.1.3. Attached ICAD developed input/output (I/O) list. (Exhibit A)

## 2. Scope of Budgetary Proposal

2.1. Industrial Control and Design, Inc. will provide engineering, panel assembly, programming services, material selection, and telemetry:

2.1.1. Modifications to the level control panel at Sierra High School Farm Pump House:

2.1.1.1. Upgrade the existing Programmable Logic Controller (PLC) with a PLC with Ethernet communication capabilities.

2.1.1.2. Add the required I/O modules for additional analog requirements.

2.1.1.3. Add an Ethernet Switch to accommodate new network requirements.

2.1.1.4. Add a copper to fiber media converter for communication by fiber optic cable.

2.1.1.5. Upgrade legacy Operator Interface Unit (OIU) touchscreen.

2.1.1.6. Replace the existing power supplies with physically smaller units to allow room for the analog modules, network switch, and copper to fiber media converter.

2.1.2. Provide and install conduit and conductors as necessary to connect the new flow meter to the control panel.

2.1.3. Provide and install a 6 strand multimode fiber optic cable in the existing conduit between the farm pump house and the school at the Sierra High School site.

2.1.3.1. Terminate and test the cable run after installation.
2.1.3.2. Connection of the fiber to copper media converter at the High School side of the cable run and assignment of IP addresses, etc., will be the responsibility of others (SUSD IT department.)

2.1.4. Provide and a SCADA server with Historian software for data logging and trending at the Sierra High School location.
2.1.4.1. The Historian software will log up to 100 data points from instruments and devices connected to the SCADA network:
2.1.4.1.1. The Pump House Control panel at the High School farm site and the Pump House control Panel at the Middle School Site.
2.1.4.1.2. Licensing will be provided for remote access to the Historian Server by two named users.
2.1.4.1.3. Current and historical trending for the flow meters and static well level will be available for viewing by the named users.

2.1.5. Upgrades and additions at the Foothill Middle School Site:
2.1.5.1. Replace the existing well pump and level control panel with a panel that will be PLC based with an OIU for level, flow and pump operation status and control.
2.1.5.1.1. The well pumps will be staged to operate in a similar fashion to the existing time-clock control.
2.1.5.2. Provide and integrate an Ethernet radio to transmit collected data to Foothill Middle School.
2.1.5.2.1. Install conduit, cable and directional antennae.
2.1.5.3. Provide the necessary hardware to receive and convert the radio signal to Ethernet at Foothill Middle School.
2.1.5.4. Provide and install conduit and wire to connect the flow meters, pump motors and well level transmitters to the new control panel.

## 3. Services Provided

### 3.1. <u>Control System Engineering consisting of:</u>

3.1.1. PLC and OIU hardware selection and/or confirmation.
3.1.2. Enclosure back panel layout design, including a bill of materials.
3.1.3. Electrical schematic design for components added to the Sierra High School farm pump house control panel under the scope of this proposal.
3.1.3.1. Control power wiring
3.1.3.2. I/O Wiring per module
3.1.3.3. PLC to OIU architecture.
3.1.3.4. PLC to SCADA PC architecture.
3.1.4. Enclosure exterior design:
3.1.4.1. Externally mounted push buttons, OIUs, etc.
3.1.5. Network Architecture
3.1.5.1. Ethernet.
3.1.5.2. Fiber Optic.
3.1.5.3. SCADA radio modem Telemetry.

**3.2. OIU Programming consisting of:**

3.2.1. Modification as necessary to include the flow meter at the Sierra High School Farm Pump House site.

3.2.2. OIU screens as required at the Foothill site as follows:

3.2.2.1. Feedback from the instruments and devices connected to the PLC.

3.2.2.1.1. (5) Level transmitters.

3.2.2.1.2. (5) Flow Meters.

3.2.2.1.3. (4) Pump motor starters.

3.2.2.2. Hand-Off-Auto operators for the pump motors.

3.2.2.3. Applicable alarm conditions and warnings.

**3.3. PLC Programming consisting of:**

3.4. PLC programming modifications at the High School Site will allow for the new flow meter and allow communication to the SCADA server.

3.5. The PLC will be programmed to duplicate the existing control system and allow for communication to the SCADA server.

**3.6. Panel Assembly consisting of:**

3.6.1. Assemble all components as defined in Section # 3.1 “Control System Engineering”.

3.6.2. All electrical panels will be constructed and built in accordance with the National Electrical Code (NEC) standard and sound engineering principals.

3.6.3. All panels will have terminal strip wiring connections for all control wires entering and exiting the panel (NEMA Class B).

3.6.4. All wires within the panel will be labeled with the appropriate wire number referencing the electrical schematic.

3.6.5. Each PLC output module will have individual fused LED terminal.

**3.7. Submittals consisting of:**

3.7.1. Manufactures specification sheet for all hardware specified and provided by ICAD.

3.7.2. All “Control System Engineering” as detailed is 3.1.

3.7.3. Associated schematics and other ICAD developed documents.

**3.8. Factory Acceptance Testing**

3.8.1. The completed panel will undergo the FAT process with the customer or authorized representative to insure that it complies with the engineering and design specification defined in this quote.

3.8.2. Not all field conditions, inputs, or outputs can be duplicated during the factory acceptance test, but all efforts will be made to create a reasonable simulation for the following:

3.8.2.1. Logic test to insure compliance with the existing pump operation at the Foothill Middle School pump house.

3.8.2.2. Control power test.

3.8.2.3. Discrete I/O tests.

3.8.2.4. Analog I/O tests.

3.8.2.5. OIU tests.

3.8.3. Customer approval and sign off are required upon a successful completion of factory acceptance testing.

**3.9. <u>On-Site Start Up Services</u>**

3.9.1. The cost allowance for on-site start-up, debug and training of the programming provided by ICAD has been budgeted into this budgetary proposal at 5 days. This does not include any overtime or off schedule hours. This initial debug can only be started once all the field wiring has been completed and tested. Additionally, communication between the Foothill Middle School control panel and Sierra high School Farm Pump House Control Panel should be verified prior to the commencement of start-up. Any additional time beyond the budgeted 5 days will be charged at ICAD's standard project rate of $105.00 per hour plus travel.

3.9.2. The cost for any delays in start-up due to equipment malfunctions, installation delays, project scheduling, delays in production, instrumentation by others, or communication problems between the high school and middle school will be in addition to this quotation.

## 4. Materials Provided

4.1. All necessary terminals, fuses, control CB, mounting hardware, wire, wire markers, etc. to provide a complete and operable system.

4.2. The main components of this system are as follows:

4.2.1. AB PLCs with the required I/O for the referenced I/O list.

4.2.2. OIU touchscreens.

4.2.3. SCADA and Historian sever.

4.2.4. A new control panel at the Middle School Pump House.

4.2.5. Ethernet radios, antennas and cable.

4.2.6. Fiber Optic cable and media converters.

## 5. Project Assumptions

5.1. All information provided by the Sierra Unified School District or their engineering representative and referenced in section #1 of this document is assumed to be accurate and complete. Any costs, delays or rework required based on incomplete or inaccurate information will be in addition to this budget.

5.2. Prior to start-up it will be the responsibility of SUSD to test and confirm communication through their existing networks between the two sites.

5.3. Any I/O requirement not identified within the scope of this budgetary proposal will be considered a change order.

5.4. It is assumed there will be adequate enclosure space for the addition of the specified components within this scope of this proposal.

5.5. The existing conduit between the Farm Pump House and the High School is sound and installed in such a manner to allow the installation of fiber optic cable.

5.6. Communication between the High School and Middle School will be over the internet by the existing SUSD network.

5.7. Network addresses or other requirements to utilize the existing SUSD network for transmission of SCADA information between the middle school and high school will be provided and configured by others.

5.8. Onsite electrical installation work for the scope of this budget proposal will be completed by ICAD's sister company: Lighthouse Electric.

5.9. All instrumentation, flow meters, level transducers, etc. are provided by other and will be installed and ready for connection to the control panels.

## 6. Not Provided

6.1. Items and services not provided within the scope of this budgetary proposal are as follows:

6.1.1. Any additional system control functionality.

6.1.2. Any field mounted sensors, switches, encoders or other devices, other than those which are specifically listed within this quotation.

6.1.3. Control or communication to any other devices or controllers.

6.1.4. Repairs or modification of the existing conduit between the High School and Pump House.

6.1.5. Requested overtime.

## 7. Benefits of an ICAD provided System

7.1. ICAD is a licensed and authorized:

7.1.1. Rockwell “Strategic Provider”

7.1.2. WonderWare “System Integrator”

7.1.3. GE Fanuc “Solution Provider”

7.2. Leading industrial automation integrator in the area.

7.3. ICAD is a UL508A compliant panel shop.

7.4. All components are non-proprietary open architecture.

7.5. All design and programming is non-proprietary with copies given to customer.

7.6. All components provided by ICAD are available from local distributors (Fresno.)

7.7. ICAD’s local support and service.

7.8. ICAD has technical staff available 24/7 for your emergency needs.

## 8. Cost

8.1. The budgetary cost for the above-described system and services is $115,175.00.

8.2. This budgetary cost includes the necessary preliminary engineering that must be completed before a final fixed cost can be determined. The preliminary engineering will consist of:

a) Detailed “Bill of Materials.”

b) Communication Architecture.

c) Submittals.

d) Fixed cost proposal to complete the project.

8.3. Work can be started immediately once a signed contract and initial payment has been received.

8.4. The Pricing on this quotation will be valid for 30 days.

## 9. Terms

9.1. The terms of payment would be as follows:

9.1.1. 10% at time of order to start the preliminary engineering. (Net 30 days)

9.1.2. 35% at submittal of preliminary engineering and fixed cost proposal. (Net 45 days)
9.1.3. 25% when ICAD receives materials. (Net 45 days)
9.1.4. 25% at completion of Factory Acceptance Testing. (Net 45 days)
9.1.5. 5% at completion of field startup or within 60 days of shop testing, whichever occurs first. (Net 45 days)

## 10. Time Line

10.1. The estimated completion time for this project is 105 working days. This time frame does not include time spent pending approvals or material delivery.



We appreciate your interest in our organization and its abilities and look forward to working with you on this project. If you should have any questions or require any additional information, please do not hesitate to call.

Regards

Cliff Taylor

Exhibit C

Map of Upper San Joaquin River Basin and Big Sandy Watershed with Project Locations Identified